My Project

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Chapter 1

The Ant Colony Optimization Algorithms

This is the main source code repository for [Ant Colony Optimization Algorithms]. It contains the standard library, and documentation.

Installing from Source

Building on ∗nix

1. Make sure you have installed the dependencies:
    - `g++` 4.7 or later or `clang++` 3.x or later
    - GNU `make` 3.81 or later
    - `cmake` 3.4.3 or later
    - `OpenMP`
    - `git`
2. Clone the `source` with `git`:

```
$ git clone https://github.com/Omgix/ant-colony
$ cd ant-colony
```

1. Build and install:

    ```sh $ cmake ./ && sudo make ```

    > ***Note:*** Install config can be adjusted by edit the cmake file

Building Documentation

If youd like to build the documentation, its almost the same:

```
$ doxygen .\Doxyfile
```

The generated documentation will appear under the `ant-colony` directory for the ABI used.
```

Chapter 2

Class Index

2.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 3

File Index

3.1 File List

Here is a list of all files with brief descriptions:

Chapter 4

Class Documentation

4.1 AntColonyBase Class Reference

`#include <AntColonyBase.h>`

Public Member Functions

- AntColonyBase (const char *filename, double alpha=15, double beta=20, double rho=0.1, double colony_eff=1.0, unsigned maxiter=500)

  brief : Read file to get dimension and points coord.
- AntColonyBase (const std::string &filename, double alpha=15, double beta=20, double rho=0.1, double colony_eff=1.0, unsigned maxiter=500)
- AntColonyBase (const AntColonyBase &)=delete
- AntColonyBase & operator= (const AntColonyBase &)=delete
- int calcTSP ()
- int recalcTSP ()

  If the optimal tour not calculated, calculate and store the result that can be gotten by getpath()
- std::deque< int > & get_path ()

  Similar to calcTSP(), but calculate anyway;.
- std::deque< double > & get_mintour_each ()

  Get the result (after calculating)
- std::deque< double > & get_mintour_global ()

  Get the length of minimal tour in each iterations.
- void printAdj (std::ostream &os)

  Get the length of minimal tour until each iteration.
- double total_len ()

  Print adjacent matrix in OS.

4.1.1 Constructor & Destructor Documentation

4.1.1.1 AntColonyBase() [1/3]

```
AntColonyBase::AntColonyBase (
            const char * filename,
            double alpha = 15,
            double beta = 20,
            double rho = 0.1,
            double colony_eff = 1.0,
            unsigned maxiter = 500 )  [explicit]
```

brief : Read file to get dimension and points coord.

param : filename is the tsp_file you want to caculate. retval : the number of print information, in bytes. return zero indicate print error ! Note:

4.1.1.2 AntColonyBase() [2/3]

```
AntColonyBase::AntColonyBase (
            const std::string & filename,
            double alpha = 15,
            double beta = 20,
            double rho = 0.1,
            double colony_eff = 1.0,
            unsigned maxiter = 500 )  [explicit]
```

4.1.1.3 AntColonyBase() [3/3]

```
AntColonyBase::AntColonyBase (
            const AntColonyBase &  )  [delete]
```

4.1.2 Member Function Documentation

4.1.2.1 calcTSP()

```
int AntColonyBase::calcTSP ( )
```

4.1.2.2 get_mintour_each()

```
std::deque< double > & AntColonyBase::get_mintour_each ( )
```

Get the result (after calculating)

brief : Get the local shortest path 's length

param : the path retval : double ,which is the the local shortest path 's length

4.1.2.3 get_mintour_global()

```
std::deque< double > & AntColonyBase::get_mintour_global ( )
```

Get the length of minimal tour in each iterations.

brief : Get the global shortest path 's length

param : the path retval : double ,which is the the global shortest path 's length

4.1.2.4 get_path()

```
std::deque< int > & AntColonyBase::get_path ( )
```

Similar to calcTSP(), but calculate anyway;.

brief : Get the shortest path

param : the Caculation retval : deque<int> ,which is the city's node

4.1.2.5 operator=()

```
AntColonyBase& AntColonyBase::operator= (
            const AntColonyBase &  )  [delete]
```

4.1.2.6 printAdj()

```
void AntColonyBase::printAdj (
            std::ostream & os )
```

Get the length of minimal tour until each iteration.

4.1.2.7 recalcTSP()

```
int AntColonyBase::recalcTSP ( )
```

If the optimal tour not calculated, calculate and store the result that can be gotten by getpath()

brief : Caculate the shortest path

param : None retval : 0 Calculate success ; -1 Fail, max iterations reach. int NMax—>max citys

int m—>number of ants

double Q—>flexible

MatrixXd phe—>Pheromone

int ant—>Ant's current locatioe

int i j k p —>loop variables

min_L —>Minimal tour in all iterations

min_path—>Path of minimal tour in all iterations

deltaphe—>Pheromone that will be added in the next iteration

min_L_local—>Minimal tour in the current iterations

Note:For each ant, perform a loop

Passed—>Used to determine if the city has passed, can it be selected

deltaphesingle—>Part of pheromone that will be added in the next

LK—>Total length of tour of the current ant

path—>Path of tour of the current ant

start—>Choose the start point randomly.

discrete_distribution—>Construct a generator with the given probability;

next—>Choose next city to visit;

omp—>Only one thread can update the information of the minimal tour.

phe—>After each cycle, update the pheromone.

4.1.2.8 total_len()

```
double AntColonyBase::total_len ( )
```

Print adjacent matrix in OS.

brief : Caculate any path 's length

param : the path retval : double ,which is the the path 's length

The documentation for this class was generated from the following files:

- AntColonyBase.h
- AntColonyBase.cpp

Chapter 5

File Documentation

5.1 AntColonyBase.cpp File Reference

```
#include "AntColonyBase.h"
#include <atomic>
#include <cmath>
#include <chrono>
#include <fstream>
#include <random>
#include <sstream>
#include <string>
#include <iostream>
```

5.1.1 Detailed Description

AntColonyBase data(argv[1]); data.calcTSP();

Author

C++project group

Version

V1.0

Date

2019-05-30

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5.2 AntColonyBase.h File Reference

```
#include <Eigen/Eigen>
#include <fstream>
#include <omp.h>
#include <string>
#include <deque>
```

Classes

- class AntColonyBase

5.2.1 Detailed Description

Example: AntColonyBase data(argv[1]); data.calcTSP();

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